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ABSTRACT

The age decrement model has traditionally been a fairly popular model of the human life span. This model has the basic premise that with increasing age there is a corresponding decrease in a wide range of abilities. Not all research has agreed with the unqualified age decrement model. This study examined the relationship between an information-processing based test battery, job performance, and age using a sample of petroleum transport drivers (N=71). Only the Auditory Selective Attention Test (ASAT) and the Group Embedded Figures Test (GEFT) were valid predictors in the information processing battery; they were significantly correlated with the number and cost of driving accidents and the cost of spills and blends. Older drivers performed worse than younger drivers on the ASAT and the GEFT, the two valid predictors. However, there were no significant age differences in the costs of both driving accidents and spills and blends. The results suggest that an increasing number of driving accidents may have resulted from factors other than age. The results also suggest that when age differences in job performance occur, they are better explained by performance on valid predictors than by age per se. Thus the results bring into question the use of age as a surrogate predictor of job performance. (Author/ABL)

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Relationships Between Personnel Tests, Age, and Job Performance

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Abstract

The relationship between an information-processing based test battery, job performance, and age was examined using a sample of petroleum transport drivers. The results suggest that when age differences in job performance occur, they are better explained by performance on valid predictors rather than age per se. The findings are discussed in the context of moderating models of job experience, the Age Discrimination in Employment Act (ADEA), and the erroneous use of age as a surrogate measure in personnel decision making.

Relationships Between Personnel Tests, Age, and Job Performance

The age decrement model has traditionally been a fairly popular model of the human life span. Its basic premise is that with increasing age, there is a corresponding decrease in a wide range of abilities, from the intellectual and cognitive (Hulicka, 1978; Lehman, 1960) to the biological and physical (Rhodes, 1983; Skinner, 1983). Research studies in information processing have also reached similar conclusions. Older subjects have been found to be poorer selective attenders; shift from a field independent to a field dependent perceptual style with increasing age; and finally, have slower perceptual-motor reaction times especially with an increasing number of response choices (Barrett, Mihal, Panek, Sterns & Alexander, 1977; Panek, Barrett, Sterns, & Alexander, 1978; Panek, Barrett, Sterns, & Alexander, 1977). Not all researchers in the field however, agree with this unqualified age decrement model (Dauphinais & Bradley, 1979).

This issue is of particular importance in personnel psychology because based on the age decrement model, chronological or functional age can theoretically be used as selection cut-off points. A primary obstacle to

applying this concept in personnel practice is that the Age Discrimination in Employment Act forbids discrimination against individuals over the age of 40. Yet although there has been a dramatic increase in the number of age discrimination cases, empirical research that focuses primarily on the older workers' test performance is lacking (Gribbin, Schaie & Parham, 1980; Lefever, Van Boren & Banarer, 1946). This absence of clear standards for evaluating older worker abilities has forced the courts, in some cases (e.g. airline transportation) to rely on chronological age as the best estimate of individual capacity.

Another problem with this approach is an emphasis that presumes declines with increasing age. This ignores the fact that there is contradicting developmental research that has not consistently supported monotonic declines in ability as a function of increasing age. Though sparse, research on the relationship between age and work productivity suggests that older employees tend to be as productive as younger workers (Kelleher & Quirk, 1973; Meier & Kerr, 1976). The positive relationship between age and job experience is usually suggested as a possible explanation; that is, older workers are able to compensate for productivity declines by taking advantage

of improved skills and knowledge gained through experience (Schwab & Heneman, 1977). A substantial body of research also reports a high degree of variability in test performance for older adults; levels of variability that often exceed that of younger age groups (Green 1969).

Thus the use of chronological age as a surrogate for ability scores in personnel decision making is not only illegal, but also lacks conclusive scientific and empirical support. It would seem that a better alternative would be to make employment decisions based on the identification and measurement of intrinsic attributes predictive of job performance; that while there may indeed be age decrements on these attributes, age should not be used as a proxy variable. This practice would ensure fairness to those older persons who may not suffer decrements on the attribute in question.

The current study assessed the relationships between test performance, age and job performance for a group of petroleum transport drivers. In doing so, we attempted to answer four questions. First, will an information-processing based test battery successfully predict job performance for petroleum transport drivers? Second, are there age differences on valid predictors; and if so, are these differences also manifest on associated criterion

measures? Third, if age differences on valid predictors are not found on associated criteria, can this be explained by job experience; that is, will there be age differences in job performance, controlling for experience? Finally, if there are decrements on both valid predictors and associated criteria with increasing age, can this decrement in job performance be best explained by increasing age per se (age decrement model) or decrements on the intrinsic attributes required for successful job performance?

Method

Subjects

The sample consisted of all transport drivers (N=78) with at least five years of tenure with a large petroleum company; however complete data was obtained on only 71. The mean age for the sample was 39 (SD=7.5). The youngest driver was 27 years old and the oldest 59. The primary job duty of these individuals was the transportation and delivery of various petroleum products. This involved loading up transport trailers with specified petroleum products at the company terminal and delivering them to receiving gas stations where they unloaded the products from the trailer.

Procedures and Apparatus

The predictor battery was information-processing based and consisted of the Portable Rod-and-Frame (PRFT) (Oltman, 1968); the Group Embedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971); and the Auditory Selective Attention Test (ASAT) (Gopher & Kahneman, 1971; Mihal & Barrett, 1976; Doverspike, Cellar, & Barrett, 1986). The choice of predictors was based first on job analysis information which indicated that tasks relevant to the job had high information processing demands and secondly on past research (e.g. Arthur, Barrett, & Alexander, 1989; Avolio, Kroeck, & Panek, 1985; Mihal & Barrett, 1976) which suggested that these predictors should be related to the criteria of interest. Each transport driver was tested individually in a quiet room. The tests were administered in the order discussed.

Criterion Data

The number and dollar cost of vehicular accidents and of spills and blends, spanning a four and a half year collection period, were obtained from company records. Spills usually result from overfilling a trailer compartment or receiving storage tank. Blends are the result of mixing two or more products. Tenure and birthdates were also obtained from company records.

Results

Insert Table 1 about here

Table 1 indicates that the ASAT was a valid predictor of the number and costs of driving accidents. It also shows that the GEFT predicted the cost of spills and blends. Age was significantly correlated with all predictors and criteria except the cost of spills and blends. To answer the second question, a t test was run on the valid predictor-criterion pairs by age. To permit comparisons of mean differences, the sample was divided into young and old groups using a median age split of 36.7. The results displayed in Table 2 indicate that there were age differences on both the ASAT and the GEFT; that is, older workers performed worse on information processing measures. Similarly, the number of driving accidents involving older workers was significantly higher than that of the younger workers. Although no statistically significant differences were found for the cost of driving accidents, the mean values for the two age groups indicate that older workers may incur higher costs as a result of their accidents.

Insert Table 2 about here

To answer the third question, tenure was partialled out of the ASAT-cost of accidents, and GEFT-cost of spills and blends relationships since these were the predictor-criterion pairs on which there were age decrements on the predictor but not the criterion. No significant differences were noted between the nonpartialled and partialled r's, indicating that tenure did not explain the pattern of these relationships.

The ASAT-driving accident relationship was the only pair in which there were age differences on both the predictor and criterion. Thus to answer the fourth question, a series of partial correlation analyses were run on this predictor-criterion pair. When age was controlled, the validity of the ASAT as a predictor of accidents dropped from .25 to .19 ($p>.05$). However, when scores on the ASAT were controlled for, the relationship between age and accidents showed a greater decrease (from .19 to .10, $p>.05$). Although the test of differences in correlations (Cohen & Cohen, 1975) for the two partialled pairs was not statistically significant, the greater loss in validity for the age/accident relationship (controlling

for the ASAT) suggests that declines in information-processing ability (i.e. the ASAT) may indeed be a better predictor of declining job performance than age per se.

Discussion

Several conclusions can be drawn from the results of this study. First, the ASAT and GEFT were the only valid predictors in the information processing battery; they were significantly correlated with the number and cost of driving accidents, and the cost of spills and blends respectively. Second, the results indicated that older drivers performed worse than younger drivers on the two valid predictors (ASAT and GEFT). This is consistent with Barrett et al., (1977) and Panek et al., (1977). On the other hand, there were no significant age differences on the costs of both driving accidents and spills and blends.

Third, job experience could not be confirmed as the explanatory factor for the absence of age differences on the costs of both driving accidents and spills and blends. This outcome is partially supported by McDaniel, Schmidt, & Hunter, (1988) who concluded that the predictive validity of job experience decreases in populations with higher experience means and job complexity.

Fourth, since both age and ASAT differences were related to driving accidents, it was instructive to

investigate which variable would best predict (the decrement in) job performance. The results of these analyses, though not statistically conclusive, suggest that an increasing number of driving accidents for this sample of petroleum truck drivers may result from factors other than age. This tentative finding is substantiated by the results of a recent meta-analysis by McEvoy & Cascio (1989) who found that age and job performance were generally unrelated. Thus higher accident rates for older transport drivers may be associated with decrements in intrinsic attributes or abilities required for successful job performance. Although the data did not be conclusively substantiate this decrement-in-intrinsic-attribute hypothesis, the difference in magnitude of the partial correlation coefficients indicated a supportive trend. That is, the ASAT (controlling for age) was more predictive of job performance than age (controlling for the ASAT). Thus these data question the use of age as a surrogate predictor of job performance.

Several limitations in the study are pertinent and should be considered with future investigative efforts. First, the availability of only a relatively small sample may have precluded the detection of statistically

significant differences. Similar studies with larger sample sizes are called for.

A second area for further evaluation concerns the generalizability of the present results to other employee populations. The decrements noted in predictor and performance measures may indeed be moderated by job type (Avolio & Waldman, 1987). For example, personnel in clerical, skilled or technical, and management or professional job categories are represented by a qualitatively different set of intrinsic attributes that underlie job performance. Avolio & Waldman (1987) have for instance, found that decreases in cognitive test performance with increasing age were much less profound for skilled than unskilled workers. Findings such as these make the global application of age decrement models in personnel decision making even more questionable.

Finally, the supportive trend in the direction of an information-processing-ability decrement model has implications for personnel selection and training. Sterns, Barrett, & Alexander (1980) have obtained positive results indicating that perceptual information processing skills of older adults can be improved through training.

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Table 1

Correlations for Predictors and Criteria

Criteria	Predictors			
	ASAT	GEFT	PRFT	Age
Spills & blends	.07	.09	.09	.20*
Cost of spills & blends	.06	.21*	.12	.09
Driving accidents	.25*	.11	.05	.19*
Cost of driving accidents	.24*	.09	.01	.22*
Age	.41***	.38***	.30*	

Note. All correlations have been transposed so that a positive correlation indicates better performance on both measures.

*p < .05 (one tailed).
**p < .01 (one tailed).
***p < .001 (one tailed).

Table 2

Means and Standard Deviations of Significant Predictor-Criterion Pairs by Age Group

	Young Group (N=35)		Old Group (N=36)		
Measures	M	SD	M	SD	T
ASAT	45.14	23.59	63.17	32.63	-2.66**
GEFT	10.43	5.34	7.47	5.05	2.40**
Cost of spills & blends	113.94	221.66	147.75	222.82	-.64
Driving accidents	.40	.65	.75	.87	-1.91*
Cost of driving accidents	206.91	578.05	1359.47	4382.25	-1.57

*$p < .05$ (one tailed).
**$p < .01$ (one tailed).